Simulation Project Requirements

This document is a guide for customers in planning and preparing simulations to be conducted at FutureFlight Central (FFC) at NASA Ames Research Center. The information provided will assist the FFC Staff in better understanding what is required. In addition, this information will be used to determine the cost of the simulation. When this document is completed and approved, it will become the Customer Requirement document.

Please complete as much of the form as possible. Indicate **TBD**, if item is to be defined at a later time. Indicate **Clarify**, if you need clarification from the FFC staff. The definition of a word or acronym noted with an asterisk (*) can be found in Appendix B.

FFC will respond to you with a cost estimate and proposed schedule within two weeks. If you decide to proceed with this simulation, we will prepare a Customer Agreement which outlines all participants' responsibilities and requires signatures for concurrence.

1. Customer Principle Investigator or Point of Contact:

Name: _____

Title: _____

Address: _____

_____

_____

Email: _____

Phone: _____

Signature: _____

Requirements Control
To be filled out by the FFC Project Manager:

Date rec'd: _____

Requirements version #:_____

2. Project Title _____

3. Background Please provide a brief description of the objectives

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4. Project Development Requirements

Simulation Scenarios*

- Airport Model (e. g. SFO): _____
- Number of different scenarios to be tested: _____
  (E.g. experimental conditions, traffic loads, flow directions)
- Baseline scenario(s) for validation? ○YES ○NO
- Number of repetitions per scenario: _____
- Duration of each run? (e.g. 45 minutes) _____
- Visual variations of the scenarios (check all applicable):

  Time of the day: ☐Day ☐Night ☐Dusk ☐Dawn

  Weather: ☐VMC* ☐IMC*

- Average Traffic Rate (number of operations/hour): _____
- Ramp control integrated in the surface movement? ○YES ○NO
- Aircraft maintenance movement? ○YES ○NO
- Ground vehicle movement? ○YES ○NO

Additional information about the scenario:

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Visual Database

- Locations for viewing airport (check all applicable):

  ☐Tower ☐Ramp Tower ☐Cockpit

- New tower locations to be tested? ○YES ○NO

- Level of complexity (see Appendix A for definitions) (select one):

  ○ Low ○ Medium ○ High

- Tower control panel for runway lighting? ○YES ○NO

- Changes to existing airport layout? If yes, specify below. ○YES ○NO

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_____

System Requirements / Facility Configuration

- Radar Displays (check all required):
  - ☐ BRITE* presentation.
  - ☐ ASDE* presentation
  - ☐ Special or additional radar requirements (specify): _____

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- Number of communication frequencies: _____

- Number of tower cab positions (How many local & ground controllers, traffic managers, flight data & clearance delivery coordinators, supervisors?) _____

- TRACON* approach/departure controller? ○YES ○NO

- Number of ramp controller positions: _____

- Flight progress strips? ○YES ○NO

- Customer furnished hardware or software

  Purpose:

  _____

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  Description of the functionality of the hardware and/or software

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  Special requirement (i.e. workspace, security issues)

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  Integration with other facilities (describe briefly):

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5. Deliverables

- ☐ Statistical Data (see Appendix C)
- ☐ Subjective Survey of Controllers/ Pilots/ Ramp Controllers
- ☐ Video/Audio Recording of Tower Cab Activities
- ☐ Digital Audio Recording of Controller/Pilot Communication
- ☐ Summary Report (brief summary of the simulation, run logs, list of data collected)
- ☐ Research Report (detailed report analyzing the data)
- ☐ Other (e.g. still images, PowerPoint presentation, video presentation):

_____

_____

6. Schedule Requirements

Simulation Period Required: between ____/____/____ and ____/____/____

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7. Third Parties and Their Responsibilities

Who else will be involved from the customer end and exactly what are they responsible for? Please provide name, affiliation, responsibility, email address and phone number.

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APPENDIX A

VISUAL DATABASE - LEVEL OF COMPLEXITY

Low Complexity

A low complexity airport database will support a daytime scene for one eye-point* only. The database will contain the following elements:

- Model of the airfield based on AutoCAD files (photo-textured with aerial photograph)
- Runways with center lines and necessary markings (photo-textured
- Taxiways with center lines (photo-textured)
- 3-D models of the significant airport structures (photo-textured) within 1 mile radius from the Tower
- Terrain surface will be a flat photo-textured plane, which extends to the usable visual range of the tower. Beyond this will be a flat generic surface extending to the horizon.
- Horizon line will be represented by photo-textured “billboard”
- No lights will be modeled

Medium Complexity

A medium complexity Airport Database will support day-, and nighttime scene. The database will be optimized for limited eye-point movement. The database will contain the following elements in addition to those defined for low complexity:

- Lighting systems for all necessary runways and taxiways. (Lights place significant load on the image generator’s ability to process the scene. They should only be modeled where NASA specifies a requirement).
- Flood lighting of ramp areas and illuminated buildings.
- 3-dimensional features enhanced throughout the airfield to achieve a compelling visual image imitating the real world.

High Complexity

A high complexity airport database will support a day-, dusk-, dawn-, and nighttime scene. The database will be optimized for up to three preset eye points (e.g. multiple tower locations, ramp towers) and moving eye-point within the airfield perimeter

Database will contain the following elements in addition to those defined for medium complexity:

- Terrain around the airfield will be enhanced to include 3-dimensional topography to the relevant horizon.
- Significant cultural features will be added to the terrain to mark obstructions and form a realistic skyline. Portions of these features may be built as billboards to conserve processing capacity.
- Luminous photo-textures will be added to create realistic night-time view of the skyline and lighting around the airport
- “Moving luminous textures” will be added to simulate highway traffic
- Final enhancements will be made to features on the airfield to achieve maximum realism within system limitations.

APPENDIX B

ACRONYMS

ASDE	Airport Surface Detection Equipment
ATC	Air Traffic Control
BRITE	Bright Radar Indicator Tower Equipment
FFC	FutureFlight Central
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Condition
TRACON	Terminal Radar Control
VFR	Visual Flight Rules
VMC	Visual Meteorological Condition

GLOSSARY

Baseline	Simulation of airport operations under current conditions (for validation and/or statistical comparisons)
Eye-Point	Viewpoint from which the airport scene is drawn (e.g. ATC tower, ramp tower or cockpit.
Scenario	Sequence of air traffic operations (arrivals, departures) occurring over the course of a simulation run.

APPENDIX C

AIRPORT SURFACE AVAILABLE DATA

Arrival Statistics:
Number of Touchdowns
Arrival Rate
Runway Occupancy Time
Inbound Taxi Duration
Number of Inbound Stops
Inbound Stop Durations
Touchdown Times
At-Gate Times

Departure Statistics:
Number of Pushbacks
Number of Takeoffs
Departure Rate
Taxi-out Duration
Number of Outbound Stops
Outbound Stop Durations
Pushback Times
Takeoff Times

Additional calculations available upon request.